

WYOMING VALLEY FLOOD CONTROL SYSTEM,
WOODWARD PUMPING STATION
East of the Toby Creek crossing by the
Erie-Lackawanna Railroad
Edwardsville
Luzerne County
Pennsylvania

HAER No. PA-339-A

HAER
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PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
Northeast Region
Philadelphia Support Office
U.S. Custom House
200 Chestnut Street
Philadelphia, P.A. 19106

HISTORIC AMERICAN ENGINEERING RECORD

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Location: East of the Toby Creek crossing by the Erie-Lackawanna Railroad
Edwardsville
Luzerne County
Pennsylvania

UTM: 18.424115.4567910
Quad: USGS Kingston, Pennsylvania

Date of Construction: circa 1940

Engineer/Architect: U.S. Army Corps of Engineers, Baltimore District; T.M. Flanagan Company
(contractor)

Present Owner: U.S. Government, U.S. Army Corps of Engineers

Present Occupant: U.S. Government, U.S. Army Corps of Engineers

Present Use: Pumping Station

Significance: The Woodward Pumping Station is one of nine similar flood control structures designed and built by the U.S. Army Corps of Engineers, Baltimore District, as part of the Wyoming Valley Flood Control System, which was constructed during the 1930s and 1940s. The Woodward Pumping Station was designed as a reinforced concrete structure with Art Deco detailing, and is significant for its association with engineering history and for its architectural design. The pumping station also is representative of the Depression era projects in the Wyoming Valley.

Project Information The Baltimore District, U.S. Army Corps of Engineers, proposes to raise the Wyoming Valley Flood Control System an average of five feet along its length to provide a higher level of protection during flooding. This levee raising will result in alterations to the exterior of the pumping station through the construction of a reinforced wall tie-out. The proposed action will adversely affect the historic appearance of this structure. In accordance with the Cultural Memorandum of Agreement (MOA) for the Wyoming Valley Levee Raising Project, the U.S. Army Corps of Engineers, Baltimore District, is required to prepare HAER documentation for the Woodward Pumping Station to mitigate the effect of exterior modifications pursuant to Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended.

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PART I. HISTORICAL BACKGROUND

Introduction

The Woodward Pumping Station was built as one of nine pumping stations constructed as part of the Wyoming Valley Flood Control System. The station is situated on the east bank of Toby Creek in the Borough of Edwardsville, Luzerne County, Pennsylvania. The Flood Control System was designed and built by the U.S. Army Corps of Engineers, Baltimore District, during the 1930s and 1940s, under authorization by the Flood Control Act of 1936. T.M. Flanagan was awarded the contract for constructing the Woodward Pumping Station.

The Flood Control System reflects the culmination of the Corps of Engineers' efforts to contain recurrent flooding in the Wyoming Valley located along the North Branch of the Susquehanna River between the Borough of Nanticoke and the Lackawanna River. Shortly after the floods of March 1936 devastated the Susquehanna Valley, Congress passed the National Flood Control Act, which acknowledged flood protection as a legitimate activity of the Federal Government. The timing of the disastrous Susquehanna River flood and the commitment of Federal assistance coincided with the era of the Works Progress Administration (WPA). The pumping stations constructed along the levees in the Wyoming Valley mark the latter years of the Depression when programs such as the WPA provided jobs for unemployed laborers, technicians, surveyors, architects, and engineers. The pumping stations derive their significance from their association with engineering history, as well as for their Art Deco style architectural design.

Historical Development of the Wyoming Valley

Initial Settlement of the Wyoming Valley, 1600 – 1782

Settlement of the Susquehanna River Valley began in the late-seventeenth century, primarily around trading posts. The Susquehanna River Valley was part of the "wilderness" that Philadelphia and other commercial centers drew upon for furs. Traders followed Indian trails, moving goods by pack horse between market towns and trading posts established in the interior. Some of the earliest settlement came in 1681 when King Charles II granted William Penn's charter. The following year, Pennsylvania was founded, and the counties of Bucks, Philadelphia, and Chester were formed.¹

Thousands of immigrants arrived in the Susquehanna River Valley during the early-eighteenth century, primarily from England, Scotland, Wales, Switzerland, and Germany.² By mid-century, a number of boundary disputes arose between the Six Nations of the Iroquois and the frontier settlement groups, who were all vying for title to the lands in and around the Susquehanna River Valley. Pennsylvania was drawn into the territorial dispute between France and England even before the French and Indian War was declared in 1756. By 1755, Indian raids became a threat as far east as Philadelphia. The Susquehanna Valley, situated to the north, was still largely in Indian hands. A number of frontier forts were established in response to the crisis.³

The Wyoming Valley was the scene of an eighteenth-century boundary dispute between Connecticut and Pennsylvania. In the summer of 1753, 250 inhabitants from Connecticut, along with a small group from Rhode Island, New York, and Pennsylvania, organized "The Susquehanna Company" to promote settlement in the Wyoming Valley. The first Connecticut settlers arrived in 1762 and established a

settlement near present Wilkes-Barre. Indians attacked this settlement and the settlers were driven out in 1763 during the Pontiac uprising.⁴

In 1768, the Penns purchased from the Indians a large section of land stretching from the northeastern to the southwestern boundary of Pennsylvania, including the Susquehanna River Valley south to present Sunbury. The British government viewed the 1768 purchase as legitimizing the Penns' claim to the area, and ordered the Connecticut settlers to stop their settlement efforts. The Connecticut settlers refused and started building forts in the Wyoming Valley. The period from 1769 to 1771 is known as the First Yankee-Pennamite War, during which Connecticut and Pennsylvania settlers fought for control of the area. The war ended in 1771 with the Pennamites surrendering Fort Wyoming.⁵

The American Revolution temporarily interrupted the Pennsylvania/Connecticut land dispute and caused another wave of fort building in the Wyoming Valley. During the Revolution, the British made attempts to weaken the colonies with attacks on frontier settlements. Settlers responded by strengthening Forty Fort, the Pittston Fort, and the Shawnee Fort and building Fort Wilkes-Barre. These efforts culminated on July 1778 with the Battle of Wyoming. Eleven hundred Tories and Indians attacked and killed many of the three hundred settlers in the region. This battle became known as the Wyoming Massacre.

The Connecticut-Pennsylvania boundary dispute was revived with the end of the Revolutionary War in 1781. The following year, the Continental Congress passed the "Decree of Trenton", which denied Connecticut's right to the contested lands and recognized Pennsylvania's claim to the disputed territory. Between the latter part of 1783 and throughout 1786, the Second Yankee-Pennamite War was waged in the Wyoming Valley. The war resulted in many lost lives and destruction of property. In November 1784, the Pennsylvania Legislature ordered that the Connecticut settlers in the Wyoming Valley be granted the right to their property. The legislature passed an act in September 1786 forming Luzerne County out of the county of Northumberland. Wilkes-Barre was named the county seat. Luzerne County included the present counties of Luzerne, Bradford, Wyoming, Susquehanna, and Lackawanna.⁷

Agricultural Prosperity in the Wyoming Valley, 1782 - 1860

The early-nineteenth century was a period of growth and agricultural prosperity for the valley, which was evidenced in the rise of riverside communities and successful industries. By 1820, flour and meal milling represented one of the largest manufacturers. Lumbering and textile manufacturing were established as other important industries. By 1850, Pennsylvania had become the main center of the lumbering industry. Agriculture continued to flourish due to the fertile river valley and nearby county seats, for example near Wilkes-Barre.⁸

Pennsylvania was known as the "breadbasket of America" until about 1840.⁹ A number of developments occurred during the mid-nineteenth century to spur farm progress. These included the introduction of scientific farming; the trend to mechanization; the organization of state associations for the improvement of farming in specialized occupations, such as dairying; and, the growth of agricultural societies, along with their county fairs. The first permanent agricultural promotion group in the United States was formed in Philadelphia as early as 1785. This group, the Philadelphia Society for Promoting Agriculture, persuaded the state legislature to authorize county agricultural societies. Improvements in farm machinery were a major interest, and mechanization proceeded at a rapid pace in the twenty years before the Civil War.¹⁰

Iron mining and manufacturing grew to become a thriving enterprise in Pennsylvania during the late antebellum period. Growth of the iron industry had a considerable impact on the coal regions near the Wyoming Valley because of the need for efficient fuel for the iron furnaces. Anthracite coal made possible a revolution in the iron process, and had a large export market as well. The early "iron plantations" of central and western Pennsylvania relied on charcoal as a fuel source. As timber resources for making charcoal were depleted, seeking an alternative fuel became imperative. The Valley Furnace, built in 1836 near Pottsville, was the first iron furnace fueled entirely with anthracite coal. By the Civil War, Pennsylvania was producing over half of the country's anthracite iron.¹¹

Improved transportation was a major concern in the first half of the nineteenth century; this concern was spurred by the necessity for Philadelphia merchants to access the resources of the state's interior. Farmers in the valley relied on the Susquehanna River to transport their produce in arks to Middletown in Dauphin County or Columbia in Lancaster County, and then over land to the markets in Philadelphia and Lancaster. The Susquehanna River, which flows through Maryland to the Chesapeake Bay, gave Baltimore easier access to the region than Philadelphia. Baltimore threatened to usurp Philadelphia's role as a market for interior goods. To help correct this problem, Pennsylvania became a pioneer in turnpike construction. Between 1802 and 1808, construction proceeded on the Easton and Wilkes-Barre Turnpike, which consisted of a 46-mile stretch from Wilkes-Barre to Wind Gap. Easton established itself as the chief market town for the merchants of Wilkes-Barre, as well as the farmers of Wyoming Valley, as a result of this turnpike.¹²

Between 1828 and 1845, extensive canal building occurred in the Susquehanna River Valley, including the Wyoming Valley. A state board was set up in 1825 to plan a privately-funded state canal system to stretch from Amity Hall, at the junction of the Juniata and Susquehanna rivers, to the border with New York. The North Branch Canal was completed in 1834, and successfully connected Wilkes-Barre with the other towns along the Pennsylvania system of canals. It also provided an important opportunity for shipping coal. Another canal was constructed that followed the West Branch of the Susquehanna from Northumberland westward. Canals were used to transport anthracite coal, as well as lumber, flour, and passengers to New York and Philadelphia. Canals remained in use until about the turn of the twentieth century; the North Branch canal closed in 1901.

The first railroad was introduced in 1843, which soon provided stiff competition to canal companies. The Lehigh Coal and Navigation Company became the first railroad company in the Wyoming Valley. The Lehigh and Susquehanna Railroad Company, which was chartered in 1837, laid down tracks from Wilkes-Barre to White Haven for both passenger and freight trains. The company's track was expanded subsequently with connections to Nanticoke and Baltimore. In 1856, the Bloomsburg branch of the Delaware, Lackawanna and Western was completed; these facilities quickly added to the importance of Wilkes-Barre and led to substantial growth of the area. By 1860, the railroad began playing a more important role in shipping freight. In that year, there were 2,598 miles of track in Pennsylvania. It was not until 1866-1867 that the Lehigh Valley Railroad and Central Railroad of New Jersey reached the Wyoming Valley. Between 1870 and 1900, the amount of railroad lines increased from 4,000 to 10,000 miles of track.¹³

Industrial Growth of the Wyoming Valley, 1860 – 1940

The rise of the iron and coal industries by mid-century, combined with improvements in transportation, changed the agricultural economy of the Wyoming Valley and ultimately shifted it to one based on mining and manufacturing. During the Civil War, Pennsylvania was "the Union's arsenal." Coal production

increased by half, and the state produced nearly seventy per cent of the pig iron in the north in 1860. Between 1860 and 1865, the Wyoming coal fields produced 9,209,768 tons that were shipped to market. The immediate post-war years set the stage for the "golden age" of Pennsylvania industry. By 1870, steel had become a separate industry from iron, and Pennsylvania produced much of the nation's supply. Anthracite coal production continued to dominate that of bituminous coal throughout this period. In the year 1903, the total production surpassed 20,500,000 tons. This situation would change, however, as the steel industry's demand for bituminous coal products grew.¹⁴

The period after the Civil War was characterized by marked urban growth and continued industrialization. While most of the state's urban centers experienced population increases, some more than tripled their populations due to specific economic factors. For example, Wilkes-Barre experienced above-normal growth due to the fact that its economy was based on anthracite coal production. The expanding opportunities and prosperity of the Wyoming Valley, particularly in the coal industry, attracted immigrants to the area. The Immigration Act of 1864 gave miners the right to import laborers from Europe to work in their mines. This resulted in the influx of large numbers of Eastern European immigrants, known as the "Great Migration." The largest group of immigrants in Luzerne County were Poles, followed by Welsh, Germans, and Italians.¹⁵

By 1900, Pennsylvania emerged as an industrial leader in the iron, steel, and coal industries. The discovery of petroleum in the northwestern portion of the state in 1859 spawned an oil boom in that region, which peaked around 1890. Portland cement was produced commercially in the Lehigh Valley after 1889. Cement and steel created "a literal revolution in industrial and commercial building construction before 1900".¹⁶ Aluminum first was produced in Pittsburgh in 1888, although it would not become commercially viable until the twentieth century. The industrial "golden age" continued during the first quarter of the twentieth century.¹⁷

The demands of World War I resulted in increased industrial activity in anthracite coal production. Luzerne County reached its peak production in 1917 with 37,700,000 tons. The prosperity of the Wyoming Valley declined drastically following World War I. This was due, in large part, to the rise of gas and oil as new fuel sources, which depressed the area's coal industry. A miner's strike in 1925-1926 further exacerbated the situation. Other factors that contributed to the area's decline included a recession in 1919 combined with a 1921 law restricting immigration. Finally, increased taxes on coal companies led to massive lay-offs and declining profits.¹⁸

Production continued to decline throughout the 1930s. The National Industrial Recovery Act of 1933, which allowed laborers to organize and bargain collectively, stimulated the economy only temporarily. The economy improved only slightly during World War II. Following the war, the region was hard hit by unemployment and depression caused by the decline of the coal industry. This decline had become the state's most serious economic problem; the coal industry had to compete with intercontinental pipelines, which were able to supply oil and gas more cheaply than coal was mined. The industrial base eventually responded by diversifying into other industries. In Luzerne County, tobacco, textiles, and food production became important after World War II.¹⁹

The Flood Control Act of 1936 and the Construction of the Wyoming Valley Flood Control System

As early as the 1820s, the Army Corps of Engineers (Army Engineers) was given the responsibility of maintaining the nation's navigable inland waterways to enable interstate commerce. Early projects focused on improving navigation on the Mississippi and Ohio rivers; building the Chesapeake and Ohio

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Canal; and, removing shipping hazards on the Missouri River. In 1852, Congress gave them the additional responsibility of river and harbor maintenance. Flood control was made an official part of the Army Engineers' operations in 1917 when flooding along the lower Mississippi River interrupted commerce. Congress passed the National Flood Control Act of 1936, which authorized flood protection as a legitimate activity of the Federal Government when the benefits outweighed the costs and specified the Army Engineers to construct dams and floodwalls as necessary for the purpose of flood control.²⁰ Adoption of this legislation greatly expanded the Corps of Engineers civil-works functions, from basic navigation control to the construction of large dams, levees, and floodwalls. Before this time, flood control measures were considered to be local efforts that should be paid for by local governments.

Prior to the mid-twentieth century, the Susquehanna River remained outside the purview of the Army Engineers since it was not a navigable river. Local residents and politicians agitated for improvements to make the river navigable during the late nineteenth and early twentieth centuries. In 1904, Secretary of War William Howard Taft ended future prospects for navigational development of the Susquehanna by designating it as a non-navigable waterway above Maryland.²¹

Although efforts failed to designate the Susquehanna River as navigable, the federal government became involved in transforming the Susquehanna River basin out of necessity for protection from flooding. Floods had periodically plagued the Wyoming Valley area. A Native American adage stated that serious flooding occurred approximately every fourteen years. The experience of early settlers seemed to prove this adage. Floods were recorded in 1744, 1758, 1772, and 1784. The highest flood recorded during the nineteenth century was in 1865. During the last decades of the nineteenth century, periodic flooding hastened in the closure of the Susquehanna canal system.²² Most of the flooding occurred during the spring months as a result of melting snow and heavy rains. Between 1891 and 1991, the Wyoming Valley was subjected to 56 floods, which have exceeded the channel bank capacity. A total of 19 of the 25 largest floods occurred between the months of January and April. Severe floods inundated the Wyoming Valley in December 1901, March 1902, and March 1904. In all three of these incidents, unusually heavy rains combined with snowmelt caused the river to overflow its banks and wash away bridges and railroad beds. The Susquehanna River Improvement Association was formed in 1902 in response to these successive disasters. In 1902, the Army Corps of Engineers undertook a survey of conditions along the North Branch of the Susquehanna River. Congress directed more detailed appraisals of the Susquehanna in 1915, 1917, and 1925. The Baltimore District Engineer, Maj. Charles R. Pettis, recommended a series of levees in connection with channel enlargement to protect the valley from future flooding.²³ However, since the cost was considered a local issue, no action was taken on this proposal.

Beginning in August 1929, several field parties initiated surveys of the Susquehanna to investigate navigation, water power, and irrigation. Flood control received only minor attention since it was felt that flood-control projects did not warrant the cost of construction, except at three discrete locations. These included Harrisburg, York, and Wilkes-Barre, where levee construction was planned. Labor for these projects was supplied under the Federal Emergency Relief Act from the Works Progress Administration (WPA).²⁴

It was not until the devastating floods of July 1935 and March 1936 that flood-control was given top priority. High water levels inflicted extensive damage in July 1935, particularly in the upper reaches of the Susquehanna in New York. The March 1936 was recorded as one of the highest floods, with a peak discharge of 232,000 cfs, or 33.07 feet.²⁵ The Susquehanna and other streams of the basin crested twice within one week. In Harrisburg, Wilkes-Barre, Kingston, Plymouth, and Nanticoke, the streets were flooded and food and medical supplies were delivered by row boat to stranded victims. On 19 March, the

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Philadelphia *Inquirer* estimated the death toll at 100 with at least 100,000 homeless.²⁶ Damages were estimated at \$67 million. Wilkes-Barre and the Wyoming Valley reported damages estimated at \$7 million.

In the wake of the catastrophe, President Franklin D. Roosevelt allotted \$43 million to the WPA for flood relief. Within days, local WPA officials recruited 48,000 workers to clean up storm damage throughout Pennsylvania. Efforts also were made at the federal level to introduce a comprehensive flood-protection program for the Susquehanna River basin. The National Flood Control Act was passed in May 1936, which authorized the expenditure of \$27,154,000 on flood control in New York and Pennsylvania. Roosevelt allocated an additional \$2.5 million in special emergency funds to be used by the Army Engineers to recruit members of the Civilian Conservation Corps (CCC) and other kinds of relief labor.²⁷

The Corps of Engineers, Baltimore District, initiated construction of the Wyoming Valley Flood Control Project in November 1936, and the project was operational by 1943. In August 1936, the Corps established an office at Kingston, Pennsylvania, to supervise flood-control projects in the Wyoming Valley. Levee construction commenced in 1937 at Edwardsville, Kingston, and Hanover. During the following year, the Corps of Engineers, in conjunction with the WPA, assumed control of the work at Wilkes-Barre. These flood-control projects played an important role in providing much-needed economic relief for the mass of unemployed workers during the Depression. "Needy professional and clerical workers found jobs as laborers, surveyors and technicians."²⁸ At Kingston, in order to provide immediate relief for the unemployed, construction was initiated using funds from the Emergency Relief Act of 1935.

Four federal flood-control projects were planned at Plymouth, Kingston-Edwardsville, Swoyerville-Forty Fort, and Wilkes-Barre-Hanover Township. In the Wilkes-Barre-Hanover area, the Corps constructed 24,660 feet of earth levees; 160 feet of concrete walls; and eight pumping stations at the cost of nearly one million dollars. At Kingston-Edwardsville, on the west bank of the Susquehanna opposite Wilkes-Barre, the Corps constructed 18,429 feet of levees.²⁹ The major portion of this section of levee had a crown width of ten feet. Both the riverside and landside slopes of the levee were seeded, except for seven sections totaling 3,200 feet, which were protected by riprap. A seepage berm and relief walls were installed along various reaches in order to control underseepage. The Borough of Kingston assumed responsibility for operations and maintenance of the Kingston-Edwardsville area of the flood-control project.³⁰

In 1940, construction was initiated at Plymouth Borough on a system of earth levees, two pumping stations, and associated drainage structures. The levee portion of the project was completed prior to World War II; the remainder of the project was finished by 1948.

Three different construction companies were awarded contracts for the construction of the pumping stations along the levees of the Susquehanna. These included the Sardoni Construction Company of Forty-Fort, the B.G. Coon Construction Company, and T.M. Flanagan. The Sardoni Construction Company constructed the majority of stations. Three stations (Church Street, Union Street, and Ross Street) were constructed by the B.G. Coon Construction Company. T.M. Flanagan was responsible for the construction of the Woodward Pumping Station; the project was awarded in April 1940 and September 1941 (under contract A-174-eng-765), and completed in 1943.

The Woodward Pumping Station was constructed on the east bank of Toby Creek, a small tributary stream along the Susquehanna River drainage. Built at a cost of \$222,650 for the structure and \$29,520 for its associated equipment, the station was designed to handle a pumping capacity of 255,000 gallons per minute (g.p.m.) for storm sewers, and 3,000 g.p.m. for sanitary sewers. The original design included

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automatic controls for the pumping units. The automatic operation proved unsatisfactory due to the lack of maintenance on the float switches, and manual operation came to be relied on. Since all pumping stations are manned during flood emergency operations, the automatic features became unnecessary.

The Woodward Pumping Station employed reinforced concrete construction. Pilasters were employed to carry the lateral loads, as well as the weight of the overhead crane and roof. The architectural design of the station was a priority due to its location in a residential area and high visibility, and incorporated such Art Deco features as scored concrete piers, decorative formwork (i.e., stylized triglyphs), and exterior metal light fixtures. Considerable difficulty was encountered during construction in pouring the concrete in the relatively thin walls with intricate formwork and heavy reinforcement. A post-construction inspection noted numerous cracks at the corners of the steel-frame windows, although steel was placed diagonally across the corners to prevent this from occurring. These cracks were caused mainly by the inability to vibrate adequately the concrete in the thin superstructure walls. Chocking also developed shortly after removal of the concrete forms from the superstructure. Another difficulty, although not very serious, was the development of sand corners, which also was due to concrete vibrating difficulty. As a result of all these problems, later pumping stations were built of different materials.

A 1945 report by the Corps of Engineers noted an unsightly and unsanitary condition at the Woodward Pumping Station in connection with the sanitary sewage flow through the open channel. During low river stages, sanitary flow from the ditch was carried to the river by a relief culvert through the levee. During high river stages, flow was diverted through the pumping station. The relatively flat bottom slope of the ditch and undiluted flow during dry stages caused sludge to deposit along the banks, as well as at the intake and outlet structures of the relief culvert. This sludge build-up made it difficult to operate the automatic floodgates of the relief culvert at the Woodward Pumping Station. The floodgates became either sealed shut or open with debris or silt, and were difficult to clean.

Modifications to the Wyoming Valley levee system took place after Tropical Storm Agnes swept through the area in June 1972. Recorded as the largest and most devastating flood on the Susquehanna River, the high waters overtopped the levees and inundated large portions of the protected areas. The levee system in place was designed for the March 1936 flood peak discharge of 232,000 cfs. The Agnes flood, in contrast, had a peak discharge of 345,000 cfs. The 1972 flood resulted in damages to the principal Wyoming Valley communities totaling \$730 million, and left approximately 25,000 people homeless and caused over 10,000 workers to be laid off. The Agnes flood led to efforts to raise the existing levee system an additional five feet.³¹ The third highest flood occurred three years later, in September 1975 when Tropical Storm Eloise moved inland over the Florida panhandle and swept through the region. A peak discharge of 228,000 cfs (35.06 feet) was recorded. In the intervening years, between 1972 and 1975, the levees were raised 1.5 to 2 feet throughout the Wyoming Valley.³²

A current levee-raising project of the Wyoming Valley was authorized under the Water Resources Development Act of 1986. The project involves increasing the height of a 15-mile stretch of levees and flood walls between three and five feet; constructing new flood walls and levees to maintain system integrity; modifying closure and drainage structures; and, upgrading and modifying the stormwater and sanitary pump stations. Total cost of the levee-raising effort is estimated at \$145 million.

PART II. ARCHITECTURAL INFORMATION

Engineering Description

The Woodward Pumping Station is divided into two entirely independent units, one outlet to handle the sewer and rainwater flow from Toby Creek and the other outlet to handle inflow from Kingston Borough. When the Susquehanna River level rises, the flow from Toby Creek is diverted to the upstream (north) half of the Woodward Pumping Station, where it is pumped into the pump discharge channel and into the river. Sewer and water inflow from Kingston Borough are handled in a similar manner, but utilize the downstream (south) half of the station. This set-up is unique to the Woodward Pumping Station, and was necessary because of the difference in established high water levels from the Toby Creek and Kingston areas.

The Woodward Pumping Station contains separate chambers with fixed weir control for the discharge structure. This was done because Toby Creek carries a considerable amount of bed load and debris, which occasionally becomes deposited in the gravity structures and, thereby, impairs their functioning and efficiency.³³ With low inflows, the water elevation in the sump is low and the corresponding static head is high. As the inflow rate increases, the water surface elevation in the sump rises and consequently the static head decreases.

Major storm structures associated with the pumping station include a 6,400-foot long, 16 and 1/2-foot diameter pressure conduit; a 3,000-foot long intercepting sewer; and, a relief culvert. The pressure conduit starts at the Toby Creek impounding basin and discharges at the pumping station. The intercepting sewer discharges through the Toby Creek culvert. During periods of high water, flow to these culverts was diverted to the Woodward Pumping Station.³⁴

The Woodward Pumping Station contains eight pumps: five in the upstream (north) section and three in the downstream (south) section. Pumps in the upstream section consist of two 50,000 g.p.m. pumps; two 30,000 g.p.m. pumps; and, a 15,000 g.p.m. pump. Pumps in the downstream section consist of one 50,000 g.p.m. pump; one 30,000 g.p.m. pump; and, one 15,000 g.p.m. pump. The total nominal capacity for the station is 270,000 g.p.m. The pump discharges from the low sump of each section are carried through the west wall of the pumping station and enter four individual discharge chambers, one for each pump. The pump discharges from the high sump of each section also are directed through the west wall of the pumping station, where they enter directly into a discharge channel. The flow from the discharge channel is deflected by a parapet wall above the outlet structure of the Toby Creek pressure conduit, and is discharged into the channel at the outlet structure of Toby Creek. Both the discharge chambers and channel are directly atop the Toby Creek pressure conduit. Pump discharges are equipped with cast metal automatic floodgates.

The downstream section of the pump pit, which is divided into a high and low sump, accommodates storm runoff and sanitary flows from acreage lying east of the station. The sewage flows into a diversion manhole, where it is diverted into an interceptor sewer and then pumped to the sewage treatment plant in Hanover Township. When the sewage flow increases to the magnitude where it overtops the diversion weir into the diversion manhole, it exits the diversion manhole and flows into the improved bed of an old creek. At low river stages, the storm runoff and sewage overflow collect in this old creek bed, are carried by gravity through twin relief culverts under the levee, and then discharged into the improved Toby Creek channel. The relief culvert consists of two, five-foot diameter precast concrete pipes with reinforced concrete entrance and outlet headwalls, and is equipped with five-foot diameter cast metal automatic floodgates. At river levels above 522.5 feet, the automatic gates on the outlet of the relief culverts are closed; the flows are then carried along the landward toe of the levee in an open ditch. When the flow

in the open ditch rises sufficiently to overtop a control weir in the ditch, it is then conducted under the levee by an uncontrolled seven-foot diameter, precast concrete conduit and discharges into the high sump of the downstream section of the sump pit.

The Toby Creek channel in the vicinity of the pumping station has been improved and paved with riprap. During low river stages, the flow in this channel from the Toby Creek intercepting sewer is conducted under the levee through a twin box culvert and is discharged into the river. The culvert consists of two, six-by-six feet reinforced concrete boxes with reinforced concrete intake and outlet headwalls, and is equipped with six by six feet cast metal automatic floodgates. During high river stages, the automatic gates are closed and the flows from the Toby Creek intercepting sewer are impounded in the Toby Creek channel. When the impounded flow rises sufficiently, an intake weir at elevation 529.5 on the east bank of Toby Creek admits the flow to an intake culvert that passes under the Toby Creek pressure conduit into the intake chamber and the high sump of the upstream section of the station.

The interior of the station was equipped with Worthington vertical mixed flow, impeller-type flood water pumps, driven by Crocker-Wheeler, vertical, high thrust, solid-shaft motors. Pumps have solid steel shafts, assembled with flanged couplings and enclosed in steel cover pipes. The pump casings employ steel, and were suspended from motor base plates and connected to discharge pipes with flanged couplings. Cast iron was used for the pump bowls and suction bells, which are flanged and suspended from pump casings. Bearings are solid sleeve type of cast bronze. Impellers are cast bronze. Discharge pipes are welded-steel, connected with flexible or flanged couplings, and terminated with cast iron, rubber-cushioned automatic floodgates. The entire rotor of each unit is supported by a double, angular-contact, thrust and guide ball bearings set, tandem mounted, in the upper bearing bracket of the motor. The line shaft connects to the motor shaft with a flanged drive coupling. Pump units have sight-feed oilers for line shaft bearings, grease lines to two pump bowl bearings, an immersion oil bath for motor guide bearings, and circulated oil baths for motor thrust bearings. The pump motors are three-phase, 60 cycle, 4,000 volt, squirrel cage type with drip-proof covers. Horsepower ratings are 125 for 15,000 g.p.m., 250 for 30,000 g.p.m., and 420 for 50,000 g.p.m. units.

The station is equipped with a metal clad switchboard for control of power, an entrance switch and wall panel for control of light and heat, ceiling features, outdoor lanterns, wall receptacles, and telephone service. The concrete slab flooring is stiffened with under-cast concrete beams in order to accommodate the load of the heavy machinery. The motor floors are designed to handle a live load of 200 pounds per square foot (psf). The roof slab and beams are designed for 30 pounds per square foot live load. A hand-operated full span 10-ton overhead traveling crane is installed in the ceiling.

Architectural Description

The pumping stations constructed as part of the Flood Control System were designed as one-story, rectangular structures. The pumping stations vary in size, but are unified by their Art Deco design and common architectural features. The primary facade of the pump stations is divided into three bays by concrete piers scored to resemble masonry. Massive, central bifold doors are positioned along the principal facade, and consist of paneled metal doors coated with cadmium plating. These doors accommodate machinery for the pumping operation. Windows along the main facade consist of four-light metal sash. Windows along the side elevations are grouped in threes, emphasizing the verticality of the Art Deco design. Concrete formwork of stylized triglyphs and decorative motifs embellish the building's exterior, a typical Art Deco characteristic.

Variations in this basic design are seen in the organization of the facade. For example, the Ross Street and Market Street pumping stations in Wilkes-Barre contain a side entrance, as opposed to an entrance on the primary facade. The overall dimensions of the pumping stations vary as well. The two pumping stations in Edwardsville are slightly larger (the Woodward Pumping Station) and smaller (the Loveland Avenue Pumping Station) than the norm.

The overall dimensions of the Woodward Pumping Station measure 89'-6" by 31'-10". The structure is raised on a reinforced concrete foundation and terminates in a flat parapet roof. The automatic floodgates and outlets are located along the west wall of this raised foundation. A decorative band of stylized triglyphs embellishes the upper wall surface of the building. Metal-sash windows were employed on the structure; the windows have been covered. The original Art Deco exterior metal lights survive intact along the primary and rear facades.

The primary (east) elevation contains a massive, paneled metal bifold door at its center framed by slightly projecting, scored concrete piers. A vertical band of windows occupies each end of this facade. Three vertical bands of window openings punctuate the north and south elevations. Slightly projecting concrete piers define the corners of these facades. The rear (west) facade is defined by a slightly projecting central section, which contains a set of double metal doors flanked by three vertical bands of window openings. Smaller rectangular louver openings are positioned above, along the band of decorative formwork. A concrete platform, or service bridge, is centered on this elevation.

Conclusion

The Wyoming Valley Flood Control Project was initiated by the Corps of Engineers during the late-1930s under authorization by the Flood Control Act of 1936, an act that authorized flood protection as a legitimate activity in the Federal Government. The Flood Control System reflects the culmination of the Corps of Engineers' efforts to contain a recurrent flooding in the Wyoming Valley. The timing of the Susquehanna River flood disaster and the commitment of Federal assistance coincided with the era of the Works Progress Administration (WPA).

The Woodward Pumping Station is one of nine pumping stations built as components of the Wyoming Valley Flood Control System. The pumping stations were constructed during the latter part of the Depression, when programs such as the Works Progress Administration (WPA) were created to provide jobs for unemployed laborers, technicians, surveyors, architects, and engineers. The resultant Art Deco style design of the pumping stations along the levees of the Wyoming Valley are indicative of the Depression era projects.

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ENDNOTES

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SITE PLAN

